

## **SP-E7 Oroville Reservoir Cold Water Pool Evaluation**

*October 25, 2002*

### **1.0 Introduction/Background**

Temperatures in the Feather River downstream of the Oroville-Thermalito Complex are managed for a number of purposes. Diversions of water for agriculture (particularly rice fields), in-stream fisheries, and the hatchery all have specific, often conflicting, temperature requirements. Currently temperatures are managed for the agricultural diversions, the hatchery, and at Robinson Riffle in the low flow section of the Feather River between the diversion dam and the Thermalito Afterbay return.

There are two basic types of temperature operation in a reservoir:

- “Real time” mode – decisions are driven by the need to meet temperatures in the present or very near future.
- “Seasonal” mode - where decisions are driven by the need to preserve the cold water pool for use at other times of the year.

The cold water pool available in Oroville Reservoir is a key component in the selection of the appropriate operational mode. This difference in operations also translates into a difference in the way temperature modeling of the reservoir is performed. Better information about the volume of cold water that is expected to be in Oroville Reservoir will assist in making better operational decisions.

### **2.0 Study Objective**

The purpose of this study is to quantify the availability of the cold water pool in Oroville Reservoir to control temperatures in the Feather River downstream of the Oroville-Thermalito Complex under a variety of operational and climatic conditions. This information will be used to assist in management of the Oroville Cold Water Pool and temperature operations of the complex.

### **3.0 Relationship to Relicensing /Need for the Study**

As part of the relicensing process questions have been raised about temperatures in the Feather River downstream of the Oroville-Thermalito Complex and how they could be managed to enhance the fisheries in the area. In order to properly control temperature operations for fishery requirements it is essential to know how much cold water is available for use in Oroville Reservoir. Without the knowledge it is impossible to set reasonable temperature standards or goals in the Lower Feather River. This issue has been raised in the Environmental Work Group discussions.

The purpose of this study to provide information on the cold water pool expected to be available in Oroville Reservoir at different times of the year. This information will be used in:

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- Environmental analysis
  - Setting appropriate temperature goals in the Feather River downstream of the Oroville-Thermalito Complex
  - Developing appropriate temperature operation policy for Oroville Reservoir
  - Developing the Oroville Reservoir Temperature Model
  - Developing the Modeling Scheme

### ***Engineering and Operations Issues Addressed***

- E4—evaluate environmental and economic aspects of different flow regimes of Oroville Facilities operations. Factors to be considered include timing, magnitude and duration of flows, pump-back scheduling and maintenance scheduling, and hatchery operations.
- E6—effect of ramping rates on downstream facilities, power generation, water supply, water temperatures, and fish.
- E12—evaluate operational and engineering alternatives including selective withdrawal from Lake Oroville, Thermalito Afterbay, the hatchery, and the low flow section to meet various downstream temperature requirements.
- E14—evaluate operational alternatives that balance and maintain acceptable water quality standards including those for MTBE under all operational plans and conditions.

## **4.0 Study Area**

The scope of this study is the Oroville Reservoir.



## 5.0 General Approach

The study will use the existing USBR Oroville Reservoir temperature model. The model is a 1-D monthly time step model developed by USBR in 1990. (Reference) The model is usually used with operational data from the USBR PROSIM model in conjunction with a number of other reservoir and river models. This myriad of models is used as part of an overall temperature evaluation of the entire Sacramento River Basin.

This model will be used to evaluate the availability of cold water, both seasonally and annually in Oroville Reservoir under varied hydrologic and climatic conditions. The use of this model is considered appropriate for this study to give some information about cold-water pool availability for use in the early stages of model and study plan development and implementation. The existing model is currently in use for impact analysis in

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the Feather River basin. While the monthly time step has limitations for real time or operational modeling this analysis is more seasonally based less concern for shorter timestep results.

If desired this analysis could be easily repeated with any new Oroville Reservoir Temperature model that may be developed using the benchmark 2001 and 2020 Statewide Operation simulation results. An evaluation of the need to re-do the analysis with the revised modeling when it becomes available would need to address the differences in the modeling. These could include:

- Difference in Oroville operations between PROSIM and CALSIM II;
- Difference in benchmark assumptions, particularly in the 2020 simulation; and,
- Difference in Oroville Temperature model results.

#### Task 1—Modify USBR Model as Required

The existing USBR Oroville Reservoir temperature model will be used as is for the initial phase of this study. Existing data will be reviewed versus the model performance but the model will not undergo a rigorous recalibrations effort.

- The existing model will need to be modified to output the computed reservoir profile each month of the simulation.
- Develop output format to allow for easy retrieval and analysis of the resulting temperature profiles.

#### Task 2—Perform the Model Runs

The PROSIM operation simulations and the Oroville temperature model runs at 2000 and 2020 levels of development are already complete. For the initial version of the analysis the temperature model would be re-run with the modifications from Task 1 to get the additional profile outputs required. The assumptions used in these simulations are very similar to the ones in the 2001 and 2020 benchmark studies.

Subtasks:

- Select appropriate PROSIM simulations for base and future conditions
- Rerun the temperature model using the newly modified temperature model to get the required profile information

#### Task 3—Analyze Results to Define Area of Impacts

This task would look at the volume of cold water expected to be available for use at Oroville Reservoir. The results will be information on the volume of cold water available for downstream temperature control purposes under varied conditions and at varied times of the year. Recommendations for “real time” and “seasonal” operation criteria will be produced.

Subtasks:

- Extract data from database
- Determine the coldwater pool availability

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#### Task 4—Write Draft Report

Complete a report documenting the procedures and results of the evaluation:

Subtasks:

- The report will include statistical, tabular and graphical representations of the available cold-water pool at different times of the year for under different operational scenarios simulated via the existing model.
- The results may serve as a guideline for developing standards of temperature requirements. There will be a limit to the amount of cold water available; hence, standards may need to be enforced with these limits in mind.

#### Task 5—Determine if Analysis is Adequate

This task will evaluate the results of the benchmark simulations compared to the previous work to see the recommendations from the draft need to be updated based on the revised modeling.

Subtasks:

- Extract data from revised modeling
- Compare to data from draft report
- Repeat analysis as required
- Document results of the evaluation

## **6.0 Results and Products/Deliverables**

### ***Results***

The results of this study will be an analysis of the availability of the cold-water pool in Oroville Reservoir for use in temperature control. Operational guidelines will be developed for use in other model development and/or in performing modeling simulations.

### ***Products/Deliverables***

The final deliverable of this study will be a report documenting the analysis including recommendations on availability of the cold-water pool in Oroville Reservoir to control temperatures in the Feather River downstream of the Oroville-Thermalito Complex. The report will be suitable for use in other studies to provide guidance on appropriate operation requirements and/or guidelines for temperature in the Feather River downstream of the Oroville-Thermalito Complex.

## **7.0 Coordination and Implementation Strategy**

### ***Coordination with Other Resource Areas/Studies***

This study will be coordinated with a number of other Engineering and Operation study plans

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- Study Plan #1c—Oroville Reservoir Temperature Model Development
  - Study Plan #2—Modeling Simulation

The development will also be coordinated with study plans from other workgroups that will require information on the cold-water pool available in Oroville Reservoir.

***Issues, Concerns, Comments Tracking and/or Regulatory Compliance Requirements***

In order for the Oroville facilities to obtain a new license the Federal Energy Regulatory Commission (FERC) requires water quality certification from the State Water Quality Control Board (SWRCB). The certification requires that SWRCB determine that the project complies with the temperature requirements of the Central Valley Water Resource Control Board (CVWRCB) Basin Plan (SPW1, 01). This study will enhance the information developed for FERC.

## **8.0 Study Schedule**

**This section to be developed.**